AMENDMENTS TO THE CLAIMS

No amendments are made to the claims. The following listing of claims is provided for convenience:

1. (Previously presented): A device for wavefront sensing and data detection, the device comprising:

an optical-to-electrical converter for receiving an optical beam encoded with data and converting the optical beam to an intermediate electrical signal, the intermediate electrical signal containing the data and further containing wavefront information sensed from a wavefront of the optical beam by the optical-to-electrical converter; and

a separation module coupled to the optical-to-electrical converter for generating an electrical wavefront signal and an electrical data signal from the intermediate electrical signal, the electrical wavefront signal containing the wavefront information and the electrical data signal containing the data.

2. (Original): The device of claim 1 wherein the optical-to-electrical converter comprises:

a photodetector.

3. (Original): The device of claim 1 wherein the optical-to-electrical converter comprises:

a coherent detector.

4. (Original): The device of claim 1 wherein, within the intermediate electrical signal, the wavefront information and the data are separated in frequency; and the separation module separates the wavefront information and the data on the basis of frequency.

5. (Original): The device of claim 4 wherein the wavefront information is located at frequencies that are lower than frequencies where the data is located.

6. (Original): The device of claim 4 wherein the wavefront information is located at frequencies less than 1 MHz and the data is located at frequencies greater than 1 MHz.

7. (Original): The device of claim 4 wherein, within the intermediate electrical signal, the data is encoded with a zero DC component.

8. (Original): The device of claim 4 wherein the wavefront information is generated by dithering an optical path of the optical beam at a dither frequency, and the wavefront information is located in a frequency band around the dither frequency.

9. (Original): The device of claim 4 wherein the separation module comprises:

a splitter for splitting the intermediate electrical signal into at least two components;

a first frequency filter coupled to receive one of the components for producing the electrical wavefront signal; and

a second frequency filter coupled to receive another of the components for producing the electrical data signal.

10. (Original): The device of claim 4 wherein the separation module comprises:

a variable gain block for applying a time-varying gain to the intermediate electrical signal; and

an automatic gain control module coupled to the variable gain block for adjusting the time-varying gain in order to equalize an amplitude of the intermediate electrical signal, wherein the equalized intermediate electrical signal contains the data and the time-varying gain contains the wavefront information.

11. (Original): The device of claim 1 wherein:

the optical-to-electrical converter comprises multiple detector elements for receiving subaperture portions of the optical beam and converting the subaperture portions of the optical beam to intermediate electrical signals; and

the separation module generates the electrical wavefront signal based on separate intermediate electrical signals, and generates the electrical data signal based on combined intermediate electrical signals.

12. (Original): The device of claim 11 wherein the separation module generates the electrical data signal based on a sum of intermediate electrical signals.

13. (Original): The device of claim 11 wherein, within the intermediate electrical signals, the wavefront information and the data are separated in frequency; and the separation module separates the wavefront information and the data on the basis of frequency.

14. (Original): The device of claim 11 wherein the separation module comprises:

a crossover network for receiving the intermediate electrical signals and separating the wavefront information and the data.

15. (Original): The device of claim 11 wherein the separation module comprises:

an amplifier for each of the separate intermediate electrical signals; and

an amplifier for the combined intermediate electrical signals.

16. (Previously presented): An adaptive optics module for wavefront correction and data transmission, the adaptive optics module comprising:

a combined wavefront/data sensor for receiving an optical beam encoded with data and generating an electrical wavefront signal and an electrical data signal from the optical beam, the electrical wavefront signal containing wavefront information sensed from a wavefront of the optical beam by the combined wavefront/data sensor and the electrical data signal containing the data; and

a variable phase device coupled to the combined wavefront/data sensor and located in an optical path of the optical beam, the variable phase device for introducing an adjustable phase in the optical path in response to the electrical wavefront signal.

17. (Original): The adaptive optics module of claim 16 wherein the combined wavefront/data sensor comprises:

an optical-to-electrical converter for receiving the optical beam and converting the optical beam to an intermediate electrical signal, the intermediate electrical signal containing the data and the wavefront information; and

a separation module coupled to the optical-to-electrical converter for generating the electrical wavefront signal and the electrical data signal from the intermediate electrical signal..

18. (Original): The adaptive optics module of claim 16 further comprising:

a transmitter for generating a counter-propagating data-encoded optical beam, wherein the transmitter is located so that the variable phase device pre-corrects the counter-propagating data-encoded optical beam.

19. (Original): The adaptive optics module of claim 16 wherein the variable phase device comprises:

a deformable mirror.

20. (Original): The adaptive optics module of claim 19 wherein the deformable mirror is a deformable curvature mirror.

21. (Original): The adaptive optics module of claim 20 wherein the deformable curvature mirror comprises:

first and second parallel plates of an electro-restrictive material, said first and second plates laminated together, said first plate having an outer surface and a mirrored surface on said first plate outer surface, and said second plate having an outer surface with a pattern of electrode segments on said second plate outer surface, each said segment having a separate electrical terminal for applying a variable

electrical voltage thereto for selectively deforming the deformable curvature mirror.

22. (Original): The adaptive optics module of claim 16 wherein the wavefront information includes wavefront curvature.

23. (Cancelled).

24. (Previously presented): The adaptive optics module of claim 17 further comprising:

a vibrating mirror located upstream of the optical-to-electrical converter, the vibrating mirror introducing a defocus in the pupil images, wherein the optical-to-electrical converter receives the defocused pupil images.

25. (Original): The adaptive optics module of claim 16 further comprising:

telescope optics for collecting the optical beam.

26. (Original): The adaptive optics module of claim 16 wherein the adjustable phase corrects only for aberrations that are of equal or lesser order than tip/tilt.

27. (Original): The adaptive optics module of claim 16 wherein the adjustable phase corrects for at least one aberration that is of equal or greater order than focus.

28. (Original): The adaptive optics module of claim 16 wherein:

the optical beam comprises a primary beam encoded with the data and a co-propagating probe beam; and

the combined wavefront/data sensor comprises:

a first detector layer sensitive to a wavelength of the primary beam, for converting the primary beam to the electrical data signal; and

a second detector layer sensitive to a wavelength of the probe beam and overlapping with the first detector layer, the second detector layer for converting the probe beam to the electrical wavefront signal.

29. (Previously presented): An FSO transceiver comprising:

telescope optics for collecting an optical beam encoded with data;

a deformable curvature mirror located in an optical path of the optical beam, the deformable curvature mirror for introducing an adjustable phase in the optical path in response to an electrical wavefront signal; and

a device for wavefront sensing and data detection located in the optical path downstream of the deformable curvature mirror, the device comprising:

an optical-to-electrical converter for converting the optical beam to an intermediate electrical signal, the intermediate electrical signal containing the data and further containing wavefront information sensed from a wavefront curvature of the optical beam by the optical-to-electrical converter; and

a separation module coupled to the optical-to-electrical converter for generating the electrical wavefront signal and an electrical data signal from the intermediate electrical signal, the electrical wavefront signal containing the wavefront information and the electrical data signal containing the data.

30. (Previously presented): The FSO transceiver of claim 29 wherein the device for wavefront sensing and data detection further comprises a vibrating mirror located upstream of the optical-to-electrical converter, the vibrating mirror introducing a defocus in the pupil images, wherein the optical-to-electrical converter receives the defocused pupil images.

31. (Previously presented): The FSO transceiver of claim 30 wherein:

the defocus in the pupil images is at a dither frequency;

the wavefront information is located in a frequency band around the dither frequency and the data is located at frequencies higher than the frequency band where the wavefront information is located; and

the separation module separates the wavefront information and the data on the basis of frequency.

32. (Original): The FSO transceiver of claim 29 wherein:

the deformable curvature mirror comprises first and second parallel plates of an electro-restrictive material, said first and second plates laminated together, said first plate having an outer surface and a mirrored surface on said first plate outer surface, and said second plate having an outer surface with a pattern of electrode segments on said second plate outer surface, each said segment having a separate electrical terminal for applying a variable electrical voltage thereto for selectively deforming the deformable curvature mirror;

the optical-to-electrical converter receives defocused images of the deformable curvature mirror and the optical-to-electrical converter comprises multiple detector elements for receiving subaperture portions of the optical beam and converting the subaperture portions of the optical beam to intermediate electrical signals; and

the separation module generates the electrical wavefront signal based on separate intermediate electrical signals, and generates the electrical data signal based on combined intermediate electrical signals.

33. (Original): The FSO transceiver of claim 29 further comprising:

a transmitter for generating a counter-propagating data-encoded optical beam, wherein the transmitter is located so that the deformable curvature mirror pre-corrects the counter-propagating data-encoded optical beam.

34. (Previously presented): A method for wavefront sensing and data detection comprising:

receiving an optical beam encoded with data;

converting the optical beam to an intermediate electrical signal, the intermediate electrical signal containing the data and further containing wavefront information sensed from a wavefront of the optical beam during said conversion; and

generating an electrical wavefront signal and an electrical data signal from the intermediate electrical signal, the electrical wavefront signal containing the wavefront information and the electrical data signal containing the data.

35. (Original): The method of claim 34 wherein:

within the intermediate electrical signal, the wavefront information and the data are separated in frequency; and

the step of generating an electrical wavefront signal and an electrical data signal from the intermediate electrical signal comprises separating the wavefront information and the data on the basis of frequency.

36. (Original): The method of claim 35 wherein the wavefront information is generated by dithering an optical path of the optical beam at a dither frequency, and the wavefront information is located in a frequency band around the dither frequency.

37. (Original): The method of claim 34 wherein:

the step of converting the optical beam to an intermediate electrical signal comprises converting subaperture portions of the optical beam to intermediate electrical signals; and

the step of generating an electrical wavefront signal and an electrical data signal from the intermediate electrical signals comprises:

generating the electrical wavefront signal based on separate intermediate electrical signals, and

generating the electrical data signal based on combined intermediate electrical signals.

38. (Previously presented): A method for wavefront correction and data transmission comprising:

receiving an optical beam encoded with data;

converting the optical beam to an intermediate electrical signal, the intermediate electrical signal containing the data and further containing wavefront information sensed from a wavefront of the optical beam during said conversion;

generating an electrical wavefront signal and an electrical data signal from the intermediate electrical signal, the electrical wavefront signal containing the wavefront information and the electrical data signal containing the data; and

adjusting a phase in an optical path of the optical beam in response to the electrical wavefront signal.

39. (Original): The method of claim 38 further comprising:

generating a counter-propagating data-encoded optical beam, wherein the adjusted phase of the optical path pre-corrects the counter-propagating data-encoded optical beam.

40. (Original): The method of claim 38 wherein the step of adjusting a phase of an optical path comprises adjusting a curvature of a wavefront of the optical beam.

41. (Original): The method of claim 38 wherein the wavefront information includes wavefront curvature.

42. (Previously presented): A method for FSO data transmission comprising:

collecting an optical beam encoded with data;

converting the optical beam to an intermediate electrical signal, the intermediate electrical signal containing the data and further containing wavefront information sensed from a wavefront curvature of the optical beam during said conversion;

generating an electrical wavefront signal and an electrical data signal from the intermediate electrical signal, the electrical wavefront signal containing the wavefront information and the electrical data signal containing the data; and

adjusting a phase in an optical path of the optical beam in response to the electrical wavefront signal.

43. (Original): The method of claim 42 wherein:

the step of converting the optical beam to an intermediate electrical signal comprises:

dithering the optical path of the optical beam at a dither frequency to generate defocused pupil images, and

converting the defocused pupil images to the intermediate electrical signal;

the wavefront information is located in a frequency band around the dither frequency and the data is located at frequencies higher than the frequency band where the wavefront information is located; and

the step of generating an electrical wavefront signal and an electrical data signal from the intermediate electrical signal comprises separating the wavefront information and the data on the basis of frequency.

44. (Original): The method of claim 42 further comprising:

generating a counter-propagating data-encoded optical beam, wherein the adjusted phase of the optical path pre-corrects the counter-propagating data-encoded optical beam.

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